French Polynesia

PBN Plan

Polynesian plan of implementation of performance-based navigation

September 2012

SNA/PF-DCA

Ressources, territoires et habitats
Énergie et climat
Développement durable
Prévention des risques
Infrastructures, transports et mer
Présent pour l'avenir

Although a national plan has been defined for the implementation of PBN (Performance Based Navigation) operations in France, a more detailed version has been drafted to take into account the geographical specificities of this region of the French Republic. Indeed, the objective is to meet the oceanic constraints, which are, in many ways, different from those in the mainland, and to fit in with the Asia/Pacific PBN Task Force working issues which SEAC/PF is contributing to.

The French Polynesia PBN Plan is a local implementation of the French Republic PBN Plan, whose general provisions are therefore not recalled.

From the needs that have been identified, SEAC/PF has developed a road map to implement the PBN Plan. This road map, which is to be detailed below, will allow the carrying out of operations in compliance with international commitments.

It also must take into account the interests of the local stakeholders from the aeronautical community. Indeed, at this step, coordination is necessary, not only for its definition but also for its time-based deployment.

Finally, this road map must be used to support the transition towards RNAV, RNP concepts, specifically to ground technical equipments, embarked equipments investments and training needs.

The context in French Polynesia

French Polynesia stretches over a surface area of 12.5 million sq-km with 130 islands spread out.
There are namely 4 state aerodromes (Tahiti-Faa'a, Raiatea, Rangiroa, Bora Bora), 1 military, 8 private and 43 territorial (Huahine and Moorea are territorial aerodromes but are operated by state personnel).
Tahiti FIR, which size is as big as Europe continent, belongs to the ICAO APAC Region.
Located between Australia and the United States, some transiting flights through Tahiti FIR can fly over a 2,675 Nm haul.

Air Traffic

In 2011, the air traffic administrated by French Polynesia rose to 13,606 VFR movements and 67,977 IFR movements, broken down as follows:

- 2.55 % as transits
- 10.70 % as international flights
- 86.75% as regional flights

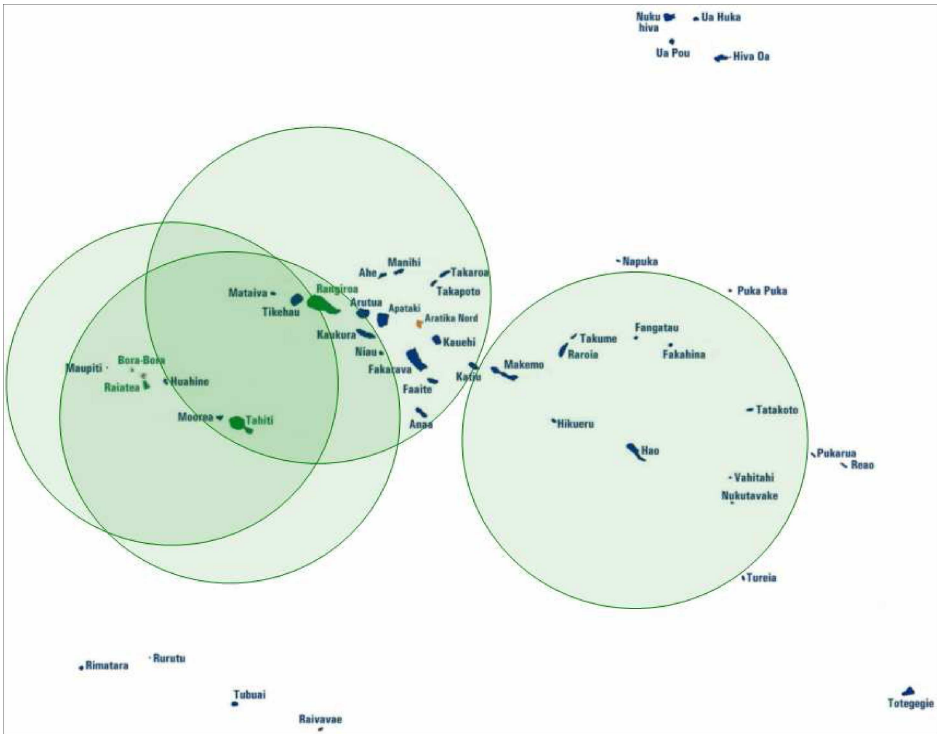
Technical equipments

The navigation aids have been the basis of IFR navigation for a long time throughout the various archipelagos in French Polynesia. NDB, VOR/DME and ILS, which are implemented, have allowed the design of the overall ATS routes network and approach procedures that link numerous airfields.

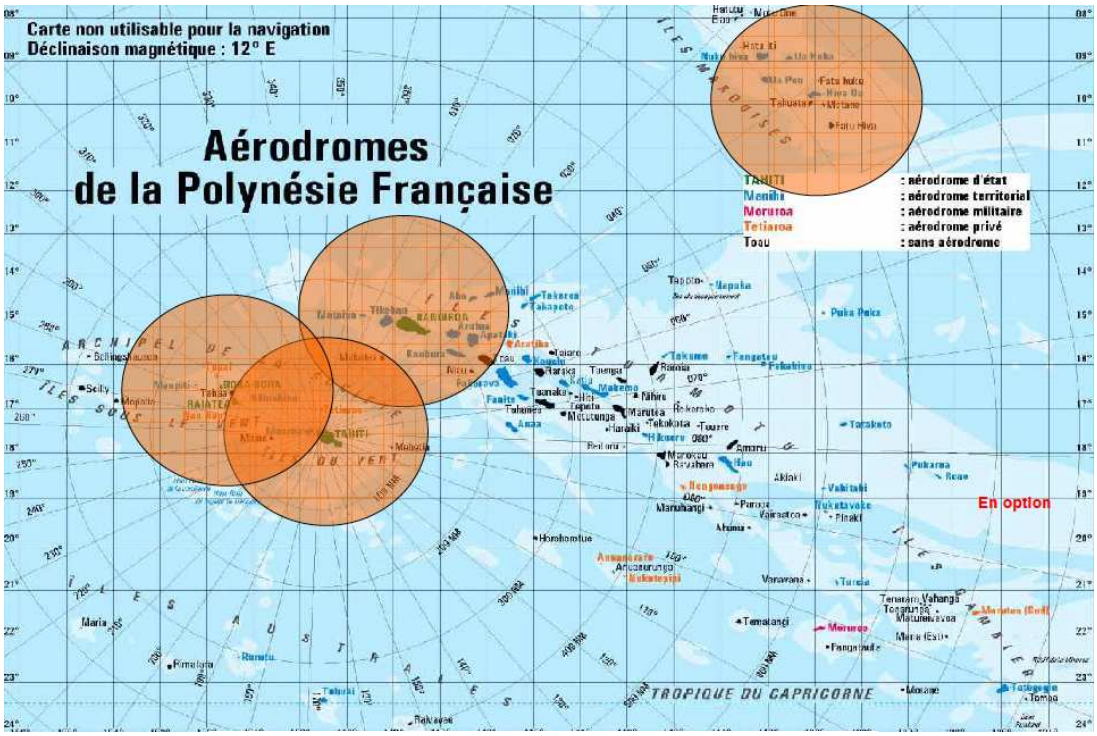
Domestic network covers over a large area of the FIR, which is essentially an oceanic airspace with constraints in terms of:

- Controller-pilot communication (VHF/HF) and
- Navigation aids.

Indeed, in this airspace, conventional VOR/DME navigation aids located in Tahiti Leeward Islands, Huahine, Rangiroa and Hao leave Marquesas and Australes islands without DME means. 23 aerodromes in French Polynesia don't have any radio navigation aids and 19 have only a NDB type fix.



VOR-DME coverage in French Polynesia



VHF coverage in French Polynesia

Separation standards used by Air Traffic control

The radar installed in Tahiti has a 200 NM range, which represents only a small part of the FIR; thus, air traffic controllers get used to mixed separation standards and procedures according to the following scenarios:

- Lateral radar separation of 5 NM
- Procedural control of 100 NM lateral and of 10 to 15 min longitudinal separations
- Geographical lateral separation based on navigational equipment or ground visual
- 1000 ft vertical separation within RVSM Airspace (FL290 / FL 410)
- RNAV10 / RNP4 50/50 separations between aircrafts compliant
- Visual separation below FL 100

The limits

Today, these equipments and methods have shown their own limits, which no longer satisfy the:

- **Costs control** requirements:
  - the geographical locations spread out over a territory as large as Europe engage high cost upkeep (maintenance, power consumption, repairs).
  - The installation of new equipment is expensive (purchase, shipment, installation).
- **Safety** requirements :
  - the wide area and the insularity that characterize French Polynesia make the equipment network undersized and impossible to replace the radar coverage;
  - these navigation fixes don't always make approach procedures on some aerodromes to be fully operated where no vertical guidance service is provided;
  - maintenance deadline is much longer.
- **Capacity** requirements: most of the time, separations using navigation aids cannot be applied between aircrafts due to their relative positions.
- **Embarked equipment performance** requirements: RNAV surface navigation permits the design of more direct and accurate routes.
- **Airlines economic and punctuality** requirements: the current separation standards applied between aircrafts lead to holdings and constraints in flight profiles, which require important fuel loading.
- **Environmental** requirements: the actual ATS routes network cannot provide new trajectories more respectful towards residents and environment in terms of noise pollution and decrease of greenhouse gas emission.

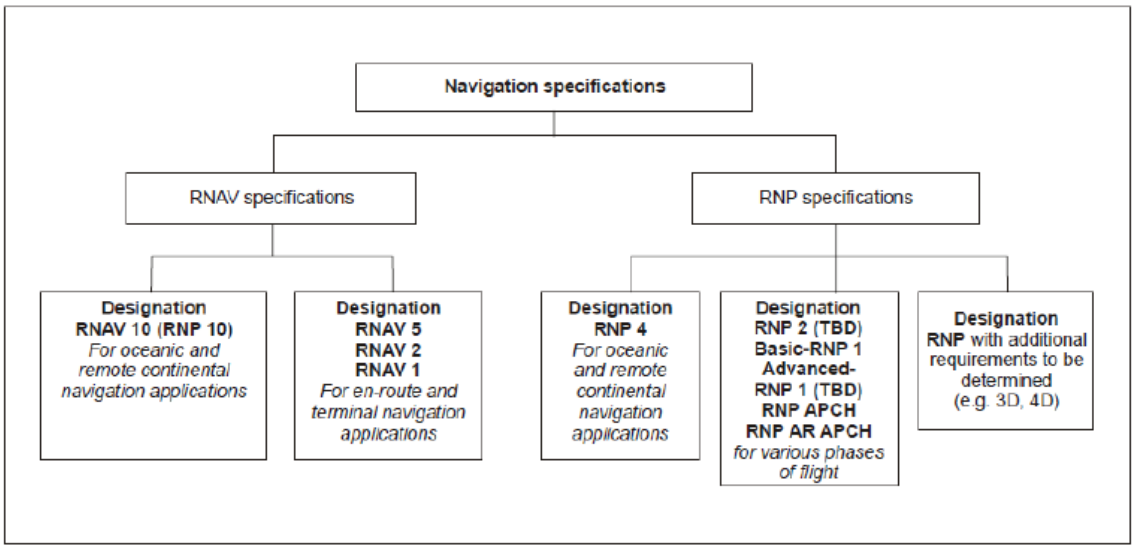
Solving problems

PBN concept contribution

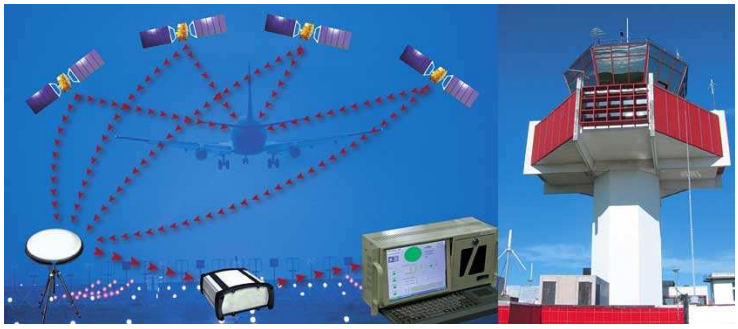
The PBN concept is contributing to optimize trajectories, which is essential to lower both fuel consumption and flight duration, while ensuring a high level of safety. The performance based navigation allows to reduce separation standards applied between aircrafts. It is a means of increasing traffic flows within a same portion of airspace by avoiding costly upgrades on board the aircrafts.

To comply with those different challenges, new navigational specifications have been developed at an international level, to enhance performance, firstly due to RNAV surface navigation and more recently to RNP Required Navigation Performance. Those two are based on the use of new satellite navigation technologies (GNSS) and embarked systems. In comparison with RNAV, RNP features an additional function on board airplanes to monitor and alert performance degradation.

Here is what the ICAO PBN Manual tells us about PBN applications according to the flight phases:



The PBN concept not only reduces the fuel costs but also noise pollution and greenhouse gas emissions. Associated with a non-stop descent procedure, the plane is more silent during approach. Within inhabited areas, the use of RNP navigation specifications permit not to fly over areas exposed to noise. A plane will always be noisy, but it will be possible to make it drift off the course to where it will be less disturbing in terms of nuisance.



The PBN implementation, mainly based upon means of Satellite navigation, must be capable of redefining with stakeholders an infrastructure matching the future needs and cost control requirement.

Coordinating activities

It is essential that the interest of all the partners of aviation must be taken into account to define the PBN operations program in long term. Will be associated:

Local: Air Tahiti Nui, Air Tahiti airlines, the military authorities and Tahiti Airport (ADT)

National: DSNA and the PBN coordination committee sponsored by the DGAC.

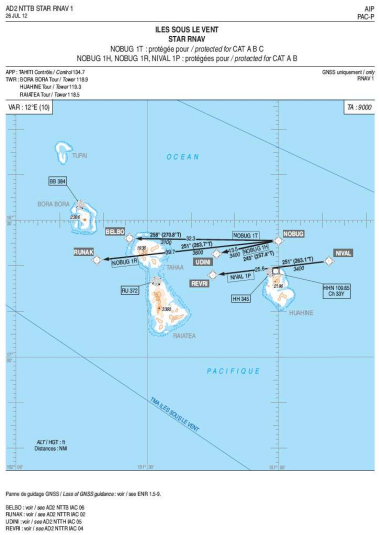
International: the PBN plan implementation will be closely linked to the activities carried out by different international organizations, by ANSPs from adjacent FIR (namely KZAK and NZZO) and, at ICAO level, by the APAC Region members.

Road map

It defines the working hypothesis which is to be considered by all of the stakeholders.
Over three periods: short term (2012/2014), medium term (2015/2019) and long term (2020 and later).

A snapshot of RNAV & RNP operations in French Polynesia

- RNP 10 (RNAV 10) oceanic airspace
- SIDs and STARs RNAV at Bora Bora, Huahine and Raiatea
- RNAV (GNSS) approach procedure at Tahiti Faa'a (RWY22), Bora Bora, Huahine and Raiatea
- RNAV GNSS report-based routes at Marquesas Islands
- Lateral/Longitudinal separations 50/50.

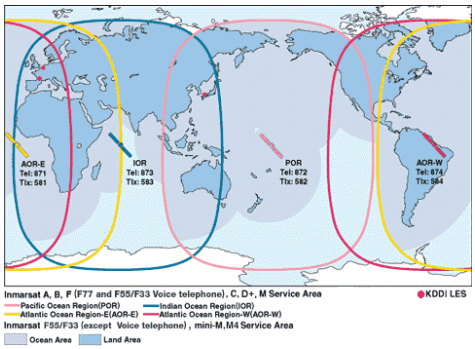


Action Plan 2012-2014

- SID/STAR RNAV and RNAV (GNSS) approach procedures design for all the aerodromes of Tahiti FIR
- Carrying on of VHF (VSAT) coverage extension
- En-route ICAO GNSS separation standard applied
- DARP procedure implementation designed for PPT-LAX City pair
- Systematic and harmonized assessment of CO2 impact in air navigation projects
- RNP10 operations in Tahiti FIR lower airspace
- Inventory of in-operation and reliable Satellites constellations.

Action Plan 2015-2019

- ATM ATS evolving system to integrate new concepts
- Tahiti FIR RNP4 implementation
- Lateral/Longitudinal separations 30/30 implementation survey
- GNSS Baro RNAV approach procedures commissioning
- ADS-B testing carrying out and assessment report from the ground station trial



2020 and later

- Development of ADS –B operating procedures
- NDB, VOR navigation aids progressive removal